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APPLIED SCIENCES

YOUNG NAVAL CAPTAIN'S STUDY, PERSEVERANCE CALLED MODEL FOR OTHERS

Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 4, Aug 79
pp 6-7

[Article by Shen Shungen [3088 7311 2704] and Guo Chunsheng [6753 2504 3932]: "Describing the Exploits of Chen Fanglin [7115 2455 2651], Captain of a Guided Missile Boat"]

[Text] No sooner had the alarm sounded than guided missile boat 5131 shot out into the broad night sea like an arrow which has just left a bow. A young, heroic captain in naval uniform stood at the wheel. A pair of bright eyes looking straight ahead, he issued his commands accurately and expertly. This was Comrade Chen Fanglin. He was the first among all the new captains to be assigned to combat duty. He distinguished himself in his battalion in numerous examinations in military technique and came to be known among his colleagues as "the leading young sea eagle."

The young sea eagle flying ahead: it is a long story how Chen Fanglin came to where he is today along a winding road. He was originally a chief missile launcher and then was promoted to executive officer. However, his knowledge of navigation was very limited, and he had difficulty reading charts. He had told his company commander, Li, several times: "The scientific technique of navigation is too complicated for me; allow me to go back to my old post as chief missile launcher!" Company Commander Li repeatedly talked to him heart to heart, describing the path he himself had followed from chief engineer to captain, and encouraging Chen Fanglin by saying: "You must use diligence in learning as a key to unlock the gate of scientific knowledge. A Communist Party member must bravely overcome any difficulty!" Chen Fanglin was greatly excited by these words and decided to break the navigation barrier.

After that he became enthralled by navigation, and he was often found in the chart room, in the dormitory, and on the beach with a book and a small notebook, reading and taking notes. So many exciting holidays and so many quiet evenings, his books on navigational science were his only companions. In less than a year he had studied numerous books and lecture notes, including "Physiographic Navigation," "Military Navigation," "Determination of Solar Orientation," "Missile Boat Tactics," and "Celestial Determination of Compass Error." While studying "Celestial Determination of

Compass Error," he was unable to understand some of the concepts, no matter how hard he tried, and this robbed him of his appetite and sleep. One Sunday, he came to Company Commander Li for help. Old Li spread the chart on the table and explained as he drew. Under the patient tutelage of Commander Li, Chen Fanglin felt as though he understood it very well. However, it became muddled again when he went home and tried it again by himself. Would he allow this obstacle to block his progress? Certainly not. He locked himself up in a room and issued an order to himself: "You may not leave this room until you have overcome this barrier." Going back to his desk, he continued to calculate; he thought as he figured; he tried again and again, until at last he was able to understand the idea and grasp the fundamental method of computation. In the evening, when a colleague of his would tell him that "there is a new movie," he would shake his head and go back to his desk to work on many more difficult problems and compose a computation table. He worked hard until he became thoroughly skilled. Only then would he bring the computation table to the company commander for inspection. The company commander gave him a nod of approval and praised his achievements. Soon afterward, Chen Fanglin displayed his mastery of the subject in a battalionwide competition on the technical foundations of the subject of navigational chartwork by scoring a high mark, surpassing even some of the old experienced captains. This was a great surprise to many of his fellow soldiers.

A few days later, his company participated in a formation attack exercise. Commander Li purposely appointed Chen Fanglin as an executive officer on the commanding boat; thus it was his responsibility as a staff officer to calculate various elements of the movements of both friend and foe so as to provide combat data to the company commander. The accuracy of his chartwork would directly affect the success or failure of the formation attack. As soon as the exercise started, the "enemy situations" changed constantly and orders came in one after another. Chen Fanglin was kept so busy and he was so worried that sweat soaked his uniform. When he finally finished his calculations with great difficulty, the company commander appeared in front of him unexpectedly and declared solemnly: "Wrong! You must have miscalculated!" Chen Fanglin hurriedly asked the radar operator to determine for a fact that the formation was heading in the wrong direction, moving away from the "enemy ships." The chance for battle was thus lost. It was as if cold water had been poured onto Chen Fanglin's heated heart.

Returning from the exercise, Chen Fanglin was walking along the seawall, dejected. Commander Li quietly came to his side and said: "What you need now is a bond between theory and practice; otherwise, destruction of the enemy is only an empty word...." This short speech moved Chen Fanglin enormously. He carefully analyzed the causes of his failure: mainly it was a lack of preparation and poor coordination between the situation at sea and on the chart. Afterwards he worked harder to familiarize himself with the maritime area. He observed carefully whenever he went out to sea. He constantly drew charts in his mind. By and by, a shapeless map of the morphological conditions of the maritime area was engraved in Little Chen's

brain. One day in September, when his company participated in a live shell exercise at sea, he was alone in charge of charting and calculations on the command boat. This time, learning his lesson from the previous event, he was well prepared. He had laid out the exercise charts and calculated the changes in movement minute by minute beforehand and had all the data tabulated. He had even prepared himself for various situations that might happen in the battle, with emergency measures for every contingency he could imagine. During this exercise, he was able to direct his boat to occupy the proper position in time to launch his guided missile, which accurately hit the target. He was praised for his work by his superior.

Later on, Chen Fanglin was promoted to captain. Three days after his promotion, he participated in a cruise in formation out at sea. While other speedboats were cruising steadily in formation, the speedboat under his command behaved like a wild horse, urshing east then west, unable to follow the track of the lead boat. A few days later, he was out at sea for a solo attack exercise. He suffered disgrace the very first time. While his boat was moving at high speed, he mistook a small islet for the target boat. In the meantime, the real "enemy boat" got away. After these two failures, his eyebrows were knit even tighter, and he deeply felt the inadequacy of the amount of knowledge he had accumulated so far. This time Commander Li gave him another timely reminder: "Don't be discouraged. But for the bitter wind and frost, how could one appreciate the fragrance of plum blossoms? There are many good teachers among the masses; you need only to learn those things they excel in." Commander Li's words ignited the flame of Little Chen's wisdom. He began, like bees collecting honey, to learn from the experiences of the others. He found out that Captain Guo excelled in steering, especially in maneuvering around the landing pier. Chen Fanglin went to his door to learn the secret. Captain Guo explained to him the gist of maneuvering around the landing pier, analyzing the dialectic relationship among the four factors: current, wind, rudder, and engine. Chen Fanglin, as if he were next to the most precious treasures, took down every word in his little notebook, and then practiced carefully. After that, he could steer his boat smartly near and around the landing pier, always succeeding at the first try and never having an accident.

In April 1978, Little Chen happened to learn about a "mental calculation method" related to torpedo boat attack. He went everywhere to inquire about this among the old and experienced comrades. He did not, however, stop at just learning about this "mental calculation method" and mastering it. He asked himself a new question: If there is a "mental calculation method" for torpedo boats, why not a "mental calculation method" for missile speedboats? What are the regular relationships between a torpedo boat and a guided missile speedboat? He consulted with the chief navigator and several experienced captains. He discussed and analyzed the subject with them whenever he could and finally came up with a "mental calculation method for guided missile speedboats." After being tested at sea several times with excellent results, the method was popularized this year throughout the entire battalion.

Chen Fanglin is a fellow who likes to use his brains. He is good not only at learning from books and from other people but, more important, from his own experiences as well. He is able to summarize his own experiences. Every time he returned from sea duty, he would carefully keep his diary, analyze the good and bad points, and write down the most significant experiences. In a period of only 3 years, he has written five diary books totaling over 200,000 words. As the old saying goes, "Diligence is genius." Chen Fanglin's military knowledge and techniques are getting sharper and sharper, thanks to his hard work. The battalion has tested Chen Fanglin for night attack techniques. There were eight ships which participated in the exercise. They grouped themselves at a spot and took turns attacking the enemy ship. There was great danger of collision. Captain Chen remained cool and composed. He got to his position in time to launch an attack and accurately hit the target. Soon afterward, the battalion tested Chen Fanglin's navigational skill at night in fog. To steer his boat he had to rely completely on the radar screen and on the displays of the other navigational instruments. He had to pass through five complicated "gates" and around several tens of islets during the entire course, which even an experienced captain could not navigate without his palms getting sweaty! However, Chen Fanglin had engraved in his brain various morphological features of the area, including such features as islets and coral beds. Therefore, he was able to navigate safely without a single error to reach his destination, and passed the test with flying colors.

Only after tasting the bitterest of the bitter can one appreciate the sweetest of the sweet. The efforts made by Chen Fanglin in grasping military techniques and steering modern equipment brought him to where he is today--flying like a leading sea eagle ahead of all the others, a model for his comrades. Comrade Chen Fanglin has not settled down under these circumstances. He has expressed his desire to learn from the heroes who distinguished themselves during the battle of self-defense and counter-attack in order to scale even higher peaks of military science. He has written thus in his diary: "I am an elementary school pupil forever before time, before the masses and before the practice."

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APPLIED SCIENCES

TORPEDO BALLISTIC CONTROL SYSTEM OUTLINED

Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 4, Aug 79
pp 12-13

[Article by Kang Fengju [1660 7364 5282]

[Text] One day, our cruiser "Xianfeng" [Vanguard] received an order to search the vicinity of Xisha Archipelago. Sonar operator Little Wang watched the display screen in front of him with concentration. Suddenly a feeble signal appeared, which became stronger and stronger.

"Reporting to captain, an enemy submarine in XX direction ahead," reported Little Wang instantly. "Prepare for torpedo attack!" the captain issued a battle command decisively.

Torpedo man Little Zhang prepared the torpedo according to the predetermined procedure, setting the depth and direction. Soon the torpedo was launched from its tube and disappeared into the water. It quickly dived at an angle of 45 degrees and its self-guidance system took over the controls to search for the target. At the depth of 100 meters, it changed to horizontal cruise. Under the control of its self-guidance system the torpedo changed its course left and right like a snake as it advanced while pursuing an enemy submarine which was trying to escape in great confusion. Suddenly it dived at a high speed. With a loud "boom" the enemy submarine that had invaded our territorial waters was destroyed and buried at the bottom of the ocean.

The situation described above is an imaginary antisubmarine battle; however, it represents the basic procedure of an actual attack. The path followed by a torpedo from the instant it leaves the tube until it hits the target is called torpedo ballistics. The ratio of hits made is directly affected by how accurately the torpedo can follow the desired path.

The torpedo's ballistic path is usually divided into horizontal plane and vertical plane ballistics. The shape of the ballistic path is determined by the type of target, the torpedo, and the payload. In the example above,

the antisubmarine torpedo ballistic changes its depth as well as its direction according to its program and the movement of the target. That is to say, the ballistics in the two planes consist of programmed and guided ballistics. Programmed ballistics are based on the maximum probability of finding the target, while guided ballistics are determined by the conditions encountered by the control system (self-guidance or wired control) in tracking the target.

The simplest ballistic path is a fixed ballistic path in which the depth as well as the direction of torpedo do not change throughout its course. For example, the uncontrolled torpedoes that are used to attack surface ships will cruise at a fixed depth determined by the draft of the target ship and the direction determined by the necessary forward angle based on the target's movement. The horizontal plane and vertical plane ballistics are separately controlled by the depth control system and the direction control system inside the torpedo. Sometimes, torpedoes are even equipped with a rolling control system. The torpedo ballistic control system consists of these three component control systems--depth, direction, and rolling.

How Are Torpedoes Controlled Automatically?

According to the performance characteristics of torpedoes, the ballistic control system must satisfy the following requirements: It must be able to control a torpedo to follow a desired ballistic path, either predetermined or dictated by the guidance system, and cruise steadily at a desired depth and direction. The distance and time required to make the adjustment from launch to steady cruising state and the maximum deviation from the desired ballistic path must be within certain predetermined ranges. The dimensions and weight of the control system must be as small as possible.

The ballistic control system consists of a control system and the torpedo itself forming a feedback control system (Fig. 1). The measuring element transforms the actual motion parameters of the torpedo into the feedback signal (displacement, pressure, electrical signal, etc.). At the same time, the desired ballistics are also transformed into a reference signal similar to the feedback signal. The control equipment compares the feedback signal and the reference signal and obtains an error signal. The error signal is processed by a system amplifier (computation, amplification, calibration, etc.), and a control signal is produced. Based on the magnitude and the polarity of the control signal, the execution mechanism steers the torpedo. Generally speaking, the horizontal rudder (or the vertical rudder) is rotated by the torque generated by the horizontal rudder activator (or the vertical rudder activator) in order to change the torpedo's movement--whether to cruise steadily, to dive, to rise, or to veer--so that the actual torpedo ballistics may approach the desired ballistics. A change in the actual torpedo ballistics affects the feedback signal,

which in turn affects the error signal. This process is repeated until the error signal becomes very small or equals zero. In summary, the principle of ballistic control is to measure and utilize the error in order to achieve its elimination or minimization.

The simplest kind of depth control system will be described here (Fig. 2). In this system, a hydraulic pressure disk is used to detect the status hydraulic pressure (a feedback signal), which varies according to the change in depth. A pendulum is used to detect the elevation angle (a feedback signal). A depth-setting spring is used to set the desired cruise depth (the reference input signal).

When the torpedo deviates from its preset depth because of some external disturbance and begins to rise (position T_1 in Fig. 3), the pressure value changes as the depth changes. The static hydraulic pressure force on the disk becomes less than what has been set on the depth-setting spring force, and this causes the connecting rod to move backward (the error signal). At the same time, the pendulum also applies a force on the connecting rod to move it backward (additional error signal), intensifying the action of the hydraulic pressure disk. The small action signal generated by the connecting rod is amplified by the horizontal rudder activator (control signal), and the amplified signal is then used to steer the horizontal rudder (execution mechanism) downward, causing the torpedo to return to its predetermined depth. As the torpedo changes to a head-down attitude, as shown at position T_2 in Fig. 3, the action of the pendulum pushes the connecting rod forward, partially canceling the action of the hydraulic pressure disk. In this way, the amount of overshoot can be somewhat reduced. The control action of the depth control system at positions T_3 and T_4 is similar to that at positions T_1 and T_2 . As a result, the deviation from the

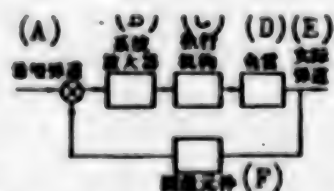


图1 鱼雷弹道控制系统示意图

Fig. 1 Illustration of torpedo ballistic control system

- KEY: (A) Desired ballistics
(B) System amplifier
(C) Execution mechanism
(D) Torpedo
(E) Actual ballistics
(F) Measuring element

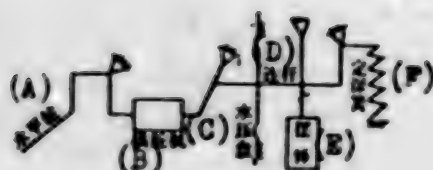


图2 一种深控系统原理图

Fig. 2 Illustration of the principle of a kind of depth-control system

KEY: (A) Horizontal rudder
(B) Horizontal rudder activator
(C) Hydraulic pressure disk
(D) Connecting rod
(E) Pendulum
(F) Depth-setting spring

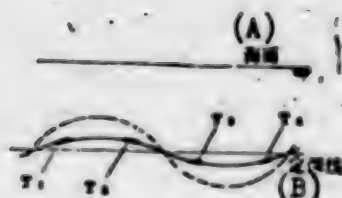


图3 鱼雷在深控下的航行情况

Fig. 3 Torpedo cruising under the control of the depth control

KEY: (A) Ocean surface
(B) Predetermined depth

preset depth can be kept within a certain required range and the deviation becomes smaller and smaller, as illustrated by the solid line in Fig. 3. The purpose of having the pendulum is to improve the torpedo's motion. Without the pendulum the torpedo cannot maintain a steady, constant depth cruise. Its motion would be a wavy, up and down motion with gradually increasing amplitude (as illustrated by the broken line in Fig. 3).

Mechanical Control vs. Electrical Control

The control systems can be divided into two major categories according to the different torpedo structures.

1. Mechanical control: In this type of control system, the measuring elements are the mechanical sensors (such as the hydraulic pressure disk and the pendulum of the control system described above, and various gyro instruments used in the direction and roll control systems). The transmitted signal consists of a change in the mechanical variable, and the types of rudder activators include pneumatic and hydraulic. The major disadvantages of this type of control system include the difficulty of programming torpedo ballistics and the difficulty of combining it with the guidance system. For example, if the depth-setting spring of the control system described above is to be programmed, a mechanical regulator must be introduced. As the program becomes more complex, the mechanism must become huge in size.

2. Electrical control: With progress in electronic technology, more and more mechanical controls are replaced by electronic controls. Electro-mechanical transducers or completely electronic transducers are used. The transmitted signals are changes in the electrical variables. After these signals are processed by an electronic amplifier, the control signals can be provided in the form of a differential error signal or an integral error signal. These signals are much better control signals. The rudder activating system consists of converters which convert the applied electrical variable into the mechanical variable, or of direct electric motor activators. The advantages of the electrical control system are the ease with which a complex program can be introduced with the use of a sequence circuit consisting of various electronic components such as relays and transistors, and the ease with which the electrical signals of the guidance system can be matched with the control system. In addition, there is a series of other advantages, including small size and weight.

The Trend of Development in Torpedo Ballistic Control Systems

Computer control is the direct result of development from electrical control. The mobility of torpedoes has increased significantly with a constantly increasing cruising speed, cruising depth, and range. The requirements on its ballistic control system are becoming more and more severe in order to guarantee steerability and stability. For example, the mutual interaction among the variables such as cruising depth, cruising direction, and rolling must be taken into consideration in order to achieve better steering characteristics. The combined processing of multiple input-output system is best handled by a computer. On the other hand, the swift development in large-scale integrated circuitry together with semiconductor storage devices enabled construction of high-power miniature computers, satisfying the requirement that the control system be small. The inertia gyro platform and the guidance system provide the computer with information related to the movement of the torpedo as well as the target. From this information, the computer is capable of calculating not only the deviation between its ballistic path and the predetermined ballistic path but also the point where the torpedo will hit the target. The commands issued by that part of the computer which is calculating the control command are quickly translated into action by the various executing systems, thus achieving high accuracy of ballistic control.

In summary, the torpedo ballistic control system is continuously being developed toward higher accuracy and greater reliability with the progress in newer measuring elements and the increase in the speed and capacity of computers.

(Drawings: Sui Zigeng [7131 5261 2577])

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STUDY OF DOLPHINS REVEALS MARITIME APPLICATIONS

Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 4, Aug 79
pp 26-27

[Article by Shi Hequn [2457 7729 5028]: "Using High-Molecular Polymer To Increase the Speed of Ships"]

[Text] Dolphins were known to man in very early times for their graceful and pleasant characteristics. They were painted on walls or cast in copper money.

More recently, many interesting stories about dolphins have been circulated constantly. And there are many characteristics of dolphins which catch people's attention. We shall discuss here mainly the revelations to man from the dolphins' superior swimming technique.

Champion Swimmer--The Dolphin

Dolphins are among the fastest swimmers in the ocean. According to one report, dolphins have been seen following a ship for 1 to 2 hours, swimming at a speed of more than 10 km/hr. According to another report, a powerboat was chasing a surprised dolphin at a speed of 19.6 km/hr, but could not catch up with it. The powerboat was finally able to catch up with it by increasing its speed to 35 km/hr. According to data obtained from observations, the maximum speed of the dolphin is estimated to be approximately 29 km/hr, roughly the same as the cruising speed of a fast passenger ship (Fig. 1).

Fig. 1 Champion swimmer of the ocean--the dolphin



图1 海洋中的游泳冠军——海豚

Ships gain their high speed from the power developed by their main engine which propels the ship forward. Now then, by what means do dolphins achieve such high speed?

Originally, people naturally thought that there must be an organ inside the dolphin which was capable of generating great power. However, people found later that there was no special organ inside the dolphin except for the muscle power with which it swims. Then, people guessed that the dolphin's muscles must be extraordinary, with exceptionally high efficiency and power. After further study, however, it has been found that though the dolphin's muscles may be powerful, they are no more powerful than those of land mammals. Well then, what in the world is the secret?

The Secret of the Dolphin's Being The Champion Swimmer

People observed the external shape of dolphins carefully and studied the structure of their skin extensively, and finally came up with the answer to why dolphins can swim so fast.

The external shape of dolphins is streamlined. We all know that a streamlined body is less affected by drag when it moves through the air or water than is an object of any other shape. That is why objects that move fast, such as airplanes, trains, automobiles, and ships, are all streamlined. Besides, dolphins have a very strange construction (Fig. 2) which enables it to achieve very low drag as it moves through the water.

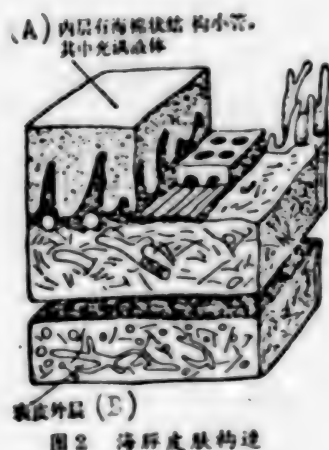


Fig. 2 The structure of a dolphin's skin

- KEY: (A) The inner layer consists of a sponge-like structure full of small tubes which are filled with a certain liquid
- (B) The outer layer of skin

A dolphin's skin is spongy, soft, and delicate; its surface is smooth, flat, and full of elasticity. The most outstanding feature of its skin is that it can expand or contract according to the surrounding pressure. As its skin expands or contracts, the flow around its body is changed and a layer of stable flow is established. This kind of flow is known as laminar flow. The drag due to laminar flow is much less than that due to turbulent flow (Fig. 3).



图3 海豚和潜艇在水中运动时
水的流动情况

Fig. 3 The flow around a dolphin and a submarine in motion under water

KEY: (A) Turbulent flow

The outer layer of a dolphin's skin is a spongy structure full of small tubes which are filled with a liquid. When a turbulent flow acts on the dolphin's skin, the liquid in the small tubes flows out, absorbing a portion of the energy from the turbulent flow and turning it into laminar flow. This way, the drag is reduced significantly.

Discoveries From Studying the Dolphin's Skin

Every means imaginable has been tried to reduce the drag on submarines in order to increase their cruising speed.

To reduce the drag due to water, the shell of a submarine is streamlined, like a dolphin.

To reduce the drag even further, modern submarines have simulated the dolphin's skin, covering the external surface with a rubber coating of special construction. The rubber coating consists of three layers. The outer layer consists of a specially made, very thin rubber film whose surface is as smooth and soft as that of a dolphin's skin. The surface layer is supported by a large number of small rubber cylinders closely packed together. The space between these small cylinders consists of countless numbers of fine tubes. These tubes are filled with a certain viscous fluid. By a specially designed device, this viscous fluid is injected into the seawater around the submarine shell, modifying the flow around the submarine shell and turning turbulent flow into laminar flow. The inner layer of the rubber coating consists of another specially made rubber film. Submarines equipped with this coating simulating a dolphin's skin were found capable of significantly reducing the drag due to water (Fig. 4).

Further research has proven that many kinds of fish are also capable of secreting a viscous fluid from their skin and achieve the same effect of reducing the drag due to water. People have painstakingly collected this viscous fluid secreted by various kinds of fish and have analyzed it. It has been identified as a kind of polyhydrocarbon high-molecular polymer.



Fig. 4 Submarine covered with artificial dolphin skin

- K.Y: (A) Upper layer
(B) Middle layer
(C) Lower layer
(D) Submarine shell
(E) Small soft tubes made of rubber
(F) Section A-A

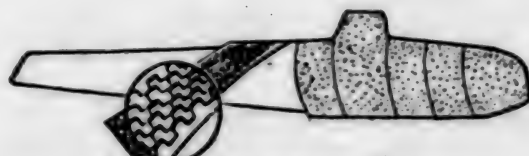


圖4 人造海豚皮敷在潛艇上

Copying the viscous fluid secreted by the fish, people have synthesized a high-molecular polymer having a molecular weight of several millions from polymerization of low-molecular groups. Injecting it into the water, it has been proven effective in reducing the drag due to water. The amount of this high-molecular polymer that is required to achieve a significant reduction in drag is very small; a concentration of one part per million is quite adequate.

Application of Drag Reduction by Means of Polymer

Reduction of drag by means of polymer injection has caught the attention of many concerned persons. Many nations have recently developed research activities in earnest to explore the mechanism and applications of drag reduction by means of polymer injection.

As stated previously, a concentrated solution of the high-molecular polymer may be stored within the shell. The fluid is injected into the water through a specially designed device to achieve a significant reduction in the drag force. A 400-ton minesweeper can reduce its drag 19 percent by this method. In addition, there are many other applications of this method on ships, including the following:

A torpedo may be covered with a coating of this polymer. Its drag can thus be reduced, with a consequent increase in its cruising speed in water (Fig. 5-1).

Ships propelled by a jet of water may inject this high-molecular polymer solution into the water jet propulsion device in order to increase the water jet velocity at the nozzle exit, thus increasing the water jet propulsion efficiency and the ship's speed (Fig. 5-3).

Ships propelled by conventional propeller may inject a minute amount of this high-molecular polymer solution onto the back side of the blade in order to increase flow velocity and lift and reduce the drag force, thus improving propeller efficiency. In addition, injection of this high-molecular polymer solution is also effective in retarding the cavitation

phenomenon on the surface of the propeller blade. The so-called cavitation phenomenon is a process that occurs at the boundary layer between the propeller blade and the water, where flow velocity is very high and pressure is low, so that the water vaporizes and forms bubbles. The cavitation phenomenon not only adversely affects propeller efficiency but also generates noise and further causes destruction of the propeller blade through erosion (Fig. 5-4).

Fig. 5. Other applications of drag reduction by means of polymer



图5 高分子降阻的其它应用

Application of a high-molecular polymer solution to hydrofoil ships has the same effect of raising the lift of the hydrofoils and retarding the cavitation process, with a consequent reduction in loss due to erosion (Fig. 5-2).

Application of high-molecular polymer to submarines can not only reduce drag but also suppress noise, thus improving their concealment. The noise generated by submarines comes not only from the propeller but also from the water's rubbing on its shell. By use of the high-molecular polymer, the noise from both sources can be effectively suppressed, which helps not only the submarine's concealment but also its sonar operation, because there is less interference (Fig. 5-5).

Research work on drag reduction in general, and on application of high-molecular polymer in particular, still has many problems that need to be solved. For example, the polymer is very expensive, the injection technique is imperfect, the total consumption of polymer is too great, and the effect is not always as desired. These problems need to be solved or ameliorated. However, we can certainly expect that research on various applications of fluid drag reduction will have a far-reaching impact on the improvement in ships' speed as a result of drag reduction, and on many other aspects of ships' performance.

(Drawings: Tao Guoxin [7118 0948 2946])

BRIEFS

SATELLITE PERTURBATION--The Purple Mountain Observatory of the Chinese Academy of Sciences has developed a new method for studying the movement of artificial satellites. This new method is called the semi-analytical, semi-numerical study of the theory of second-stage perturbation in the movement of artificial satellites. Its superiority lies in the simplicity of the formula, the high degree of precision and the small number of calculations performed. Usually, either the analytical method or the numerical method is used to calculate the movement of artificial satellites. The formula of the analytical method is complex and as many as several ten thousand items must be calculated. The system of numerical calculation has a high degree of precision and the formula is simple, but the number of calculations is enormous. The Purple Mountain Observatory has absorbed the superior features of the analytical and numerical systems to create a new semi-analytical, semi-numerical system. This new system has provided China with a sound new theoretical base in developing satellite surveying and satellite navigation. [Text] [Shanghai JIEFANG RIBAO in Chinese 10 Aug 79 p 3]

UNMANNED HYDROMETEROLOGY STATION--Recently an unmanned hydrometeorology station was placed in the south part of the Yellow Sea--Huanghai just north of the mouth of the Long River--Changjiang. Day and night it monitors the changing conditions in ocean temperature, air pressure, wind velocity and wind direction. The Qingdao [7230 1497] Instrument and Meter Research Institute successfully built the hydrometeorology station, which is China's first large-scale telemetric marine buoy hydrometeorology station for observation of the sky and sea. It has 3 components, cabin, mast, and platform, and is much like a small round ship moored at sea. It is securely fixed to the sea floor by 3 anchor chains. This station can obtain hydrometeorological information in severe weather conditions that would prevent boats from doing so. This is a new addition to our means of marine forecasting, marine research and scientific work. [Text] [Shanghai JIEFANG RIBAO in Chinese 10 Aug 79 p 3]

PHOTOELECTRIC COLORMETERING--The Northwest Telecommunications Engineering College has successfully devised an instrument for photoelectric colormetering. Among its uses are the measurement of the content of micro-substances in solutions as well as the analysis and determination of the composition, purity and density of steel, petroleum, pharmaceutical and chemical products. The delivery and numbering of the test specimen as well as the mathematical operation and display of the test results are all automatically performed. [Text] [Shanghai JIEFANG RIBAO in Chinese 10 Aug 79 p 3]

ULTRA-LONG-RANGE WEATHER FORECASTING--The meteorology station of Donggou [2639 3297] county, Liaoning not only is capable of making accurate short-range, middle-range and long-range forecasts, it also can make ultra-long-range forecasts. The Donggou Meteorology Station, located in the Northeastern province of Liaoning, in 1974 made an ultra-long-range weather forecast: From 1966 to 1985 the whole county will have a rather dry period. Since this forecast was made, this county's annual precipitation has consistently been below normal. Starting in 1972 the Donggou Meteorology Station conducted 2 years of investigation and research and concluded that this county would undergo a 60-year cycle which followed the basic laws of change by having 20 years of primarily dry weather, 20 years of primarily waterlogging and 20 years of normal precipitation. The experts at the meteorology station examined the county records for the last 100 years and collected over 70 years of materials on local hydrology conditions. They also went to the countryside to interview elderly peasants. Starting from this basis they investigated the relationship between sunspots, the earth's rotation and the shifting of the earth's poles and other astronomical factors with dry and wet weather in Donggou county. These, combined with the laws governing precipitation make up the ultra-long-range weather forecast. [Text] [Shanghai JIEFANG RIBAO in Chinese 10 Aug 79 p 3]

NEW OPTICAL ROTATING GLASS--The Tianjin Silicate Research Institute has successfully developed a magnetic-optical rotating glass. The first time that this optical glass was tested on the Tianjin University laser holographic light elasticity apparatus it demonstrated the capacity required for use. Optical rotating glass is a non-metallic substance. This type of glass can be used in optical modulation and has many valuable applications in laser and electronics technology. [Text] [Tianjin TIANJIN RIBAO in Chinese 11Jul 79 p 2]

NEW RESEARCH RESULTS--The China University of Science and Technology recently calculated that it has 108 scientific research projects successfully completed or in various stages of successful progress. Ren Xiaoping [0117 1420 1627], a female lecturer in the Department of Modern Mechanics, who performs research on the aspects of mottling, defocusing and amplitude measurement in lasers, not only corrected an error in an internationally used formula but also derived 4 correct formulas, suggesting the "rules of movement in a space mottling field." She and her co-workers together worked on "the use of mottle photography to measure full-field displacement from a surface." This method solved the problem of making precise measurements of the quantity and composition of vibrating objects. The successful completion of these two research projects received world wide acclaim from scholars in the field. The Chemicals Research and Teaching Laboratory of the Department of Modern Chemistry conducted practical experiments demonstrating comparably high standards in the transfer rate of rare earth catalysts in automobile exhaust purification. These results received serious consideration at the recent National Conference on Atmospheric Pollution and Controls Technology. The China University of Science and Technology also has a number of fruitful research projects still in progress, among them the preparatory work on the ultravacuum system and the physical planning for a synchronic betatron; the receiver portion of a spectrographer for magnetic resonance in superconducting nuclei. All of these results are on a very advanced level. [Text] [Beijing GUANGMING RIBAO in Chinese 10 Oct 79 p2]

NEW OIL WELL TESTER--The Guangzhou Minature Electric Machine Plant with the help of the Guangzhou Electric Equipment Scientific Research Institute, successfully developed a comprehensive under-well testing apparatus that is powered by a magnetoelectric direct current. It has undergone on-site testing at the Daqing and Shengli oil fields demonstrating excellent capabilities and has recently gone into mass production. This comprehensive testing apparatus is one of our currently most advanced well-testing instruments and it can collect such important data as the oil well's crude oil pressure, density, the water bearing capacity of the strata and the volume of flow. In the past well testing was carried out with vibrator pumps and was neither very reliable nor very easy to perform. The present magnetoelectric powered apparatus drives a gear pump. The testing is performed by sections, the test-time is reduced and the workers can also observe the machine's operating condition. [Text] [Guangzhou NANFANG RIBAO in Chinese 17 Aug 79 p 2]

ZHEJIANG COMPUTER SOCIETY--Zhejiang Provincial Computer Society was recently founded in Hangzhou. (Jiang Yalin), deputy secretary general of the provincial scientific and technological association, addressed the foundation ceremony on holding more research activities in the province. The inaugural meeting also adopted a charter and elected a board. (He Zhijin) was elected chairman of the board while (Zhang Xuebiao) and (Gu Cunjin) were elected vice chairmen. [OW150543 Hangzhou Zhejiang Provincial Service in Mandarin 1100 GMT 8 Nov 79 OW]

CSO: 4008

LIFE SCIENCES

BAREFOOT DOCTORS TESTED WITH VIEW TO UPGRADING PROFESSIONAL STANDARDS

Beijing BEIJING RIBAO in Chinese 11 Nov 79 p 2

[Article: "Beijing Holds Professional Examinations for Barefoot Doctors"]

[Text] In order to upgrade the professional standards of barefoot doctors and to consolidate and develop rural medical services, the city of Beijing recently held examinations for barefoot doctors. A "Barefoot Doctor Diploma" was issued to those who passed the examinations.

The health bureaus of each county (district) had placed particular emphasis on these examinations. Prior to the examinations, all commune hospitals were instructed to form guidance classes and fix a guidance plan. Even the small hospitals which lacked the facilities to organize guidance classes were required to take the guidance work to the people.

Taking part in the examinations were more than 9,700 barefoot doctors--82.3 percent of the number required. Of these, 83.8 percent passed. The average score was 71.1. The passing rate for Shunyi, Miyun, and Tongxian counties was 90 percent and the average grade was 75.

CSO: 4008

SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

BIOGRAPHIC INFORMATION ON SCIENTISTS

[The following biographic information on selected scientists was extracted from the Chinese-language newspapers as indicated at the end of each item.]

[Text] Bian Boming [6708 0130 2494]

Vice president, Shanghai Branch, Chinese Academy of Sciences; on 27 Sep 79, he attended a tea party to commemorate the 30th anniversary of the founding of the PRC in Shanghai. (Shanghai JIEFANG RIBAO 28 Sep 79 p 1)

Feng Depei [7458 1795 1014]

Vice president, Shanghai Branch, Chinese Academy of Sciences. (Shanghai JIEFANG RIBAO 21 Oct 79 p 1)

Feng Guangren [7458 1639 0088]

Director, Institute of Animal Husbandry and Veterinary Medicine, Guangdong Academy of Agricultural Sciences. (Guangzhou NANFANG RIBAO 18 Sep 79 p 3)

Gui Lifeng [2710 4539 0023]

Director, Shanghai Institute of Materials [Shanghai Cailiao Yanjiusuo 0006 3189 2624 2436 4282 4496 2076], Chinese Academy of Sciences; on 27 Sep 79, he attended a tea party to commemorate the 30th anniversary of the founding of the PRC in Shanghai. (Shanghai JIEFANG RIBAO 28 Sep 79 p 1)

Huang Yifeng [7806 6654 1496]

President, Shanghai Academy of Social Sciences; on 17 Sep 79 he attended a ceremony marking the reopening of East China College of Political Science and Law. (Shanghai JIEFANG RIBAO 19 Sep 79 p 2)

Jiang Zhongfan [3068 1767 1581]

Vice chairman, Shanghai Municipal Scientific and Technical Association. (Shanghai JIEFANG RIBAO 21 Oct 79 p 1)

Kang Tiejuan [0121 6993 7165]

Director, Tianjin Institute of Semiconductor Technology [Tianjin Bandaoti Jishu Yanjiusuo 1131 3160 0584 1418 7555 2111 5890 4282 4496 2076]; on 5 Oct 79 he attended a citywide scientific-technical symposium on the occasion of the 30th anniversary of the founding of the PRC. (Tianjin TIANJIN RIBAO 7 Oct 79 p 1)

Li Zhengyi [2621 2973 3015]

Deputy director, Institute of Soil and Fertilizer, Shanghai Academy of Agricultural Sciences. (Shanghai JIEFANG RIBAO 21 Oct 79 p 1)

Ma Hong [7456 3163]

Vice president, Chinese Academy of Social Sciences; on 28 Sep 79 he accompanied Vice Premier Bo Yibo on a visit to the Wuyuan County area in Nei Monggol Autonomous Region struck by an earthquake recently. (Beijing BEIJING RIBAO 30 Aug 79 p 1)

Wang Wenda [3769 2429 6671]

Secretary, Secretariat, China Scientific and Technical Association. (Beijing CONGREN RIBAO 11 Jul 79 p 2)

Wang Yizhen [3769 7328 2823]

Deputy Director, First Institute of Oceanography, State Oceanography Bureau; author of an article, "Thirty Years of Oceanographic Work [in China]." (Hong Kong ZHONG GUO XINWEN 11 Sep 79 p 7)

Wu Hongyuan [0702 7703 0337]

Deputy Director, Rice Institute, Jilin Provincial Academy of Agricultural Sciences. (Beijing GUANGMING RIBAO 2 Nov 79 p 2)

Yang Shixian [2799 4258 0341], Prof.

Director, Tianjin Branch, China Scientific and Technological Association; on 29 Sep 79, he attended and spoke at a tea party to commemorate the 30th anniversary of the founding of the PRC in Tianjin. (Tianjin TIANJIN RIBAO 2 Oct 79 p 2)

Zhang Qin [1728 0530]

President, Guangdong Academy of Medical Sciences [Guangdong Yixue Kewueyuan 1639 2639 6829 1331 4430 1331 7108]. (Guangzhou NANFANG RIBAO 2 Nov 79 p 2)

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SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

LIU DONGSHENG OF GUIYANG GEOCHEMISTRY INSTITUTE JOINS PARTY

Beijing GUANGMING RIBAO in Chinese 8 Oct 79 p 2

[Text] The Director of the Seventh Laboratory, Guiyang Institute of Geochemistry, Chinese Academy of Sciences and the Vice Chairman of the Board of Directors, China Environmental Sciences Society, Liu Dongsheng [0491 2639 3932] joined the Chinese Communist Party a short time ago. This sixty-two year old scientist finally realized the greatest wish of his life.

Professor Liu Dongsheng has engaged in geological research for several decades. He has worked cautiously and never neglects anything. He has contributed a great deal to China's geological research. From the late 1940's to the early 1950's, he carried out a great deal of research work on fish fossils of the Devonian Period. Since 1954, together with young comrades, he began to carry out an overall survey of loess, which is a soil found only in China. Liu Dongsheng spent three whole years to observe very closely the topography and the condition of the loess in the three provinces of Shanxi, Shaanxi, and Gansu to obtain a large quantity of first hand materials. Afterwards, under his leadership and organization, the book "Zhongguo de Huangtu" [China's Loess] was written. It includes the four parts of "A Survey Report of Quaternary Geology of the Middle Reaches of the Huanghe," "Loess of the Middle Reaches of the Huanghe," "Loessic Deposits of China," and "Material Composition and Structure of Loess," totaling more than 800,000 characters. This book gives a systematic and thorough discussion of China's loess to reflect an indepth study of China's loess to reach the advanced level in the nation. It has also attracted the attention of scientists in related fields of the world. Furthermore, Liu Dongsheng has also accomplished a great deal in China's Quaternary geology, environmental protection, endemic diseases, etc.

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CSO: 4008

SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

RESEARCH ACCOMPLISHMENTS OF CHINA UNIVERSITY OF SCIENCE, TECHNOLOGY INTRODUCED

Hong Kong ZHONGGUO XINWEN in Chinese 26 Oct 79 pp 5, 6

[Text] (Chinese News Agency, 25 Oct, Hefei) At a series of meetings of educational and scientific reports held by China University of Science and Technology just before and after the National Holiday, 108 new results and primary results of scientific research accomplished by the university were introduced.

The papers "Relativity and Astrophysics," "Theoretical Model of SS433 Star," etc. written by the director of the university's Astrophysical Laboratory, Fang Lizhi [2455 0536 0037] in cooperation with the Italian scientist Lufei-ni have been given attention and praise by international astronomical circles. The papers "Statistical Analysis of Stars with Distinguishable Components and the Determination of Retardation Factors," etc. which the author wrote in cooperation with other Chinese scientists have also been regarded as being of high scientific standard.

The work of preparation and research for making an electron synchronous radiation accelerator is being carried out at the university; at present, the ultra-high vacuum system and the physical design portion of the accelerator have already been completed.

Not long ago, the paper, "Principle of Motion Spatial Dispersion Field" published by Wu Xiaoping [3124 1420 1627], a young female lecturer of the Department of Modern Mechanics produced all the equations describing the relationship between dispersion motion and the motion of a material object; a large number of experiments were also carried out to verify the accuracy of these equations. Her work will be helpful in clarifying many problems in the dispersion measurement technology and in correcting some errors in the equations currently in use. Wu Xiaoping also wrote papers, titled "Research on Laser Diffuse Focus Diffuse Spot Oscillation Measurement," "Using Diffuse Spot Photography for the Measurement of Abcission Shift of the Entire Field," etc. in which new techniques of qualitative and experimental determination of oscillating bodies are proposed. The diffuse spot oscillation measurement technique currently in use in the world has thus been advanced and a new way of equipotential abscissa line for obtaining abscission deformation is proposed. The research results of Wu Xiaoping have received good reviews from her international colleagues.

The Modern Chemistry Department of that university has also successfully made a rare earth catalyst for purifying automobile exhaust. The catalyst has been experimentally tested on diesel engines and results comparable to those of similar products of foreign countries have been obtained.

Liu Renhual [0491 0086 2037], a lecturer of the Department of Modern Mechanics of that university has obtained five results in his work of elastic mechanics, etc. to receive honors from the Chinese Academy of Sciences. In his papers "Wave Pattern Round Board Characteristic Equation," "Characteristic Relation Equation of Wave Pattern Round Board with a Smooth Center," etc. he used the method of revision and repeated substitution to propose solution and analysis suitable and accurate for wave pattern round boards of different depths and shapes. Computations have proved that his equation is more precise and accurate than existing foreign equations and has broader application as well. Furthermore, he also studied such problems as the nonlinear curvature of veneered round board, high compression fixing heat exchanger thick piped board, stability of dual-metal flat cone shell, etc. to provide highly precise analytic equations for use in engineering designs.

Most recently, that university also successfully made a high power and high efficiency iron oxide magnetism test instrument to be used in constructing a proton synchronous accelerator. The instrument has reached the international advanced level.

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SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

VICE PREMIER YU QIULI VISITS INSTITUTE OF SYNCHRONOUS ACCELERATOR IN HAMBURG

Hong Kong ZHONGGUO XINWEN in Chinese 27 Oct 79 p 2

[Text] (Chinese News Agency, 26 Oct Beijing) News from Hamburg: Vice Premier Yu Qiuli [051 4428 6849], accompanied by Nobel laureate Professor Ding Zhaozhong [0002 5128 0022] and Professor Wang Qiaolin [3769 0829 3829] visited the German Institute of Synchronous Accelerator in Hamburg on the morning of the 25th.

The Chairman of the institute, Dr Shuo-pei-er explained to Vice Premier Yu that due to the most recent breakthrough--the proof of existence of colloids--this institute has become more famous than ever. The expensive and advanced instruments and equipment of the institute and its highly capable workers attract scientists from everywhere of the world. At present, half of the physicists working at the institute have come from other countries.

When he spoke of cooperation with China, he said: The institute has already transported certain instruments to China, which are needed to construct a similar research center in China. He pointed to three instruments on a long table in another room saying that these instruments are also about to be shipped to China.

Currently, the institute has eleven Chinese graduate students and scientists who are working under the leadership of Dr Ding Zhaozhong. Dr Shuo-pei-er said: "These young Chinese scientists work very diligently. They also contributed to the breakthrough we obtained most recently."

Afterwards, he, Dr Ding Zhaozhong, and others in charge at the institute accompanied Vice Premier Yu to view the major link of the most recent important discovery. They also visited a computer room. This computer room supplies 200,000 pieces of data per day. They also observed other parts of the research center.

Finally, Vice Premier Yu Qiuli was photographed with the Chinese scientists. He urged them to work earnestly and to learn diligently.

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SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

ANNUAL CONFERENCE OF OCEANOGRAPHY, LIMNOLOGY HELD

Hong Kong ZHONGGUO XINWEN in Chinese 29 Oct 79 p 7

[Text] (Chinese News Agency, 27 Oct, Wuhan) From 9 to 14 October the Third Conference of Representatives and the Annual Conference of China Oceanography and Limnology Society were held in Wuchang to review the rich accomplishments in recent years in oceanography and limnology in such aspects as hydrophysics, chemistry, geology and topography, hydrobiology, and research and manufacture of survey instruments, etc.

This was the largest scale discussion meeting of oceanography and limnology since the establishment of the nation. Participants included the famous ichthyologist Wu Xianwen [0124 3759 2429], the algologist Rao Qinzhi [7437 2953 2972], marine biologist Zeng Chengkui [2582 0701 1145], the marine physicist He Chongben [6378 1504 2609], and more than 230 scientists, technologists, and educators coming from 15 provinces, cities, and autonomous regions of the country.

The conference received more than 400 papers, with rich contents involving a vast number of subjects. Papers entitled "Distribution of Heavy Sand in the Coastal Region of Fujian and Research on the Electrolytic Method of Producing Titanium," "Systematic Breeding of Fish of the Suborder of Carp," "Discovery of Algal Choline of Blue Algae and Its Significance," and research studies on fossil algae were reported to demonstrate new fruits and new levels of oceanographic and limnological studies in China. Many representatives voiced strong protest against the large scale land reclamation projects that have encroached on the lakes of China to cause destruction of hydrological resources and ecological balance. There were many good suggestions during the meeting concerning acceleration of development and modernization of China's sciences and technologies.

The famous American marine geologist, Professor Ai-mo-li, the geological dating biochemist, Professor Bei-da, the Chinese United States citizen geochemist Dr Zhou Caihua [0719 2071 5478], the Canadian microbiologist Professor Xin-pu-sen, the algologist Professor Mo-ke-la-ke, and the Chinese

Canadian citizen algologist Dr Chen Qinming [7115 2953 2494] came to attend the conference by invitation and delivered scientific reports as well. Extensive exchanges were carried out during the meetings between Chinese and foreign scientists.

The conference elected Wu Xianwen, Zhu Yuangding [2612 0337 7844] and Rao Qinzhi as Honorary Chairmen of the Board of Directors. Zeng Chengkui was elected as the Chairman of the Board of Directors and 89 persons were elected to serve as directors. Six vacancies on the board of directors were reserved for the regions of Taiwan, Hong Kong, and Aomen [Macao].

From 16 to 18 [Oct] meetings were held for the establishment of the three secondary societies of China Ichthyology, Algology, and Marine Meteorology.

China Oceanography and Limnology Society is one of the mass scientific organizations established relatively early when New Ch'na was first established. In these thirty years the group of China's oceanographers and limnologist has grown rapidly and the membership has developed from over two hundred to over two thousand. In the early days of the liberation, the realm of study was primarily biology. It has now developed to include physics, chemistry, geology-topography, marine meteorology, research and manufacture of survey instruments, and marine engineering, and many important accomplishments of scientific research in these branches have been obtained.

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CSO: 4008

BIOPHYSICS

AUTHOR: LIU Yumin [0491 5148 3046]

ORG: Shanghai Institute of Physiology, Chinese Academy of Sciences

TITLE: "New Advances in the Study on the Bleaching and Regeneration of Vertebrata ~~in-situ~~ Vision Rod Pigment (I)"

SOURCE: Beijing SHENGWUHUAXUE YU SHENGWUWULI JINZHAN [Progress in Biochemistry and Biophysics] No 3, Jun 79 pp 1-18

ABSTRACT: Commemorating the centennial pionner publications of Kùlhne on vision pigments, the author reviews recent advances in the research on the bleaching and regeneration of in situ vision rod pigments, which all proves and substantiates Kùlhner's conviction of the existence of Rhodopsin and its related function in the retina. This section of the article deals with the research on the slow decay, the decay and regeneration caused by trifle bleaching, the regeneration after extensive bleaching, the fast decay, and the vision rod pigments of different receptors and different animals of isolated perfused retinas. The article is to be continued.

This paper was received for publication on 5 January 1979.

AUTHORS: DIAO Yuncheng [0431 0061 4453]

WANG Yunjiu [3076 0061 0046]

ORG: Both of Fifth Laboratory, Institute of Biophysics, Chinese Academy of Sciences

TITLE: "Information Preprocessing in Vertebrata Visual System -- I. Foundation of Neural Structure and Function"

SOURCE: Beijing SHENGWUHUAXUE YU SHENGWUWULI JINZHAN [Progress in Biochemistry and Biophysics] No 3, Jun 79 pp 19-26

ABSTRACT: Reviewing advances in recent research on the neural structure and functions of the visual system of vertebrata in the preprocessing of light information at various cellular layers, the author summarizes the findings that tend to explain the mechanism and physiology of the transmission of visual information at the light receptor levels, in the intermediate cellular layer, and in the visual center, as well as the function of the ganglionic cellular layer in the transmission of visual informations.

This paper was received for publication on 20 November 1978.

AUTHORS: WANG Yunjiu [3076 0061 0046]
DIAO Yuncheng [0431 0061 4453]

ORG: Both of Fifth Laboratory, Institute of Biophysics, Chinese Academy of Sciences

TITLE: "Information Preprocessing in Vertebrata Visual Systems -- II. Mathematics Models, Electronic Models and Discussion"

SOURCE: Beijing SHENGWUHUAXUE YU SHENGWUWULI JINZHAN [Progress in Biochemistry and Biophysics] No 3, Jun 79 pp 26-32

ABSTRACT: Based on a review on the characteristics of the various mathematics models and electronics models proposed on the information processing in vertebrata visual systems since the 60's, especially those proposed in China, the authors discuss the significance of the roles of lamellar tissue structure and parallel processing system in pattern recognition in vertebrata visual systems, their plasticity, and the problems of learning and memory that must be encountered eventually in visual system research.

This paper was received on 20 November 1978.

AUTHOR: JIN Gueichang [6855 6311 2490]

ORG: Institute of Biophysics, Chinese Academy of Sciences

TITLE: "Simulation of Neurones and Neural Networks"

SOURCE: Beijing SHENGWUHUAXUE YU SHENGWUSULI JINZHAN [Progress in Biochemistry and Biophysics] No 3, Jun 79 pp 32-38

ABSTRACT: Based on a review on the structure and functions of neurones, the history of the simulation of the nervous system, the development of neural simulation techniques, and the modern simulation of visual pattern recognition of the nervous network, the author discusses the significance and prospect of further broaden the range of models, and improvement of its structure and components, with the application of the principle of parallel processing to the present sequential processing in electronic digital computers in the simulation of the functions of animal visual systems.

This paper was received for publication on 20 September 1978.

AUTHOR: CAI Haoran [5591 3185 3544]

ORG: Fifth Laboratory, Institute of Biophysics, Chinese Academy of Sciences

TITLE: "Mechanism of Electric Reaction and Synaptic Transmission of Cells in Vertebrata Retina"

SOURCE: Beijing SHENGWUHUAXUE YU SHENGWUWULI JINZHAN [Progress in Biochemistry and Biophysics] No 3, Jun 79 pp 39-45

ABSTRACT: The author reviews recent research on the mechanism of electric reaction and synaptic transmission of cells in vertebrata retina, that has so far revealed the electric reactions of light receptive cells, bipolar cells, horizontal cells, apodous cells, and ganglionic cells, some relationships between the structure and functions of different cells within the retina, and the action of light receptive cell transmitters on such second order cells as horizontal and bipolar cells, and the chemical composition of light receptive cell transmitters, but is still well behind in the probe on the synaptic transmission between the second order neurones and the third order neurones (like ganglionic cells), and the reverse "feedback" synaptic transmission between the neurones. This paper was received for publication on 22 April 1978.

AUTHOR: None

ORG: Entomological Compound Eye Optic Information Processing Research Group, Institute of Biophysics, Chinese Academy of Sciences

TITLE: "Optical Characteristics of the Compound Eye Crystal Columns of *Pyrococelia pekinensis*"

SOURCE: Beijing SHENGWUHUAXUE YU SHENGWUWULI JINZHAN [Progress in Biochemistry and Biophysics] No 3, Jun 79 pp 45-50

ABSTRACT: The study on the optical characteristics of the compound eye of *Pyrococelia pekinensis* reveals that the compound eye is composed of more than 4,000 small eyes, the dioptric system of the crystal columns has higher refractive index on the axis, but lower at the edges, and the crystal columns has the capability to converge light to form inverted image, and bend light to form erect image. Mathematical and biological prototype studies both indicate that the position of the main points of the conical units changes with length to form real, virtual, erect and inverted images respectively, where both the Gauss formula and the Newton formula apply.

This paper was received for publication on 8 December 1978.

AUTHOR: None

ORG: Entomological Compound Eye Optic Information Processing Research Group, Institute of Biophysics, Chinese Academy of Sciences

TITLE: "Comprehensive Image-Forming Principle of Tabulate Compound Eye Lenses"

SOURCE: Beijing SHENGWUHUAXUE YU SHENGWUWULI JINZHAN [Progress in Biochemistry and Biophysics] No 3, Jun 79 pp 51-55

ABSTRACT: Based on the comprehensive image-forming principle derived from the study on the compound eyes of *Pyrococelia pekinensis* that comprehensive erect image can be formed when the ratio of the incident and emergent angles of light approaches one, thallium glass lense is subjected to ionic exchange treatment to obtain parabolic distributive refractive indexes that simulates the dioptric system of compound eyes. The principal parameters of the simulated comprehensive image lenses are: same object and image distance of about 3 mm, resolution reaches 25 lines/mm, and visual field angle 40°. The prospective application of the lenses to miniature and optic printing, and opticinformation processing is also discussed.

This paper was received for publication on 8 December 1978.

AUTHOR: None

ORG: Fifth Laboratory, Institute of Biophysics, Chinese Academy of Sciences

TITLE: "Limulus Eye Lateral Inhibition Electron Model to Improve the Articulation of Low Illumination Television Pictures"

SOURCE: Beijing SHENGWUHUAXUE YU SHENGWUWULI JINZHAN [Progress in Biochemistry and Biophysics] No 3, Jun 79 pp 55-59

ABSTRACT: This article reports an electron model that simulates the lateral inhibition of limulus eyes to improve the articulation of low illumination television pictures. The simplified lateral inhibition network has hexagonal structures similar to limulus compound eyes with six inhibition points arrayed hexagonally and symmetrically. The measures incorporated to help reduce picture noises and improve the articulation of the television pictures include adoption of circuit time parameters based on the characteristics of noise and spatial frequency, determination of the band width of interlinear inhibition signals, and others.

This paper was received for publication on 20 January 79.

AUTHOR: LU Huimin [7120 1920 3046]

ORG: Fifth Laboratory, Institute of Biophysics, Chinese Academy of Sciences

TITLE: "Computer Simulation of Certain 'Vision Invariability'"

SOURCE: Beijing SHENGWUHUAXUE YU SHENGWUWULI JINZHAN [Progress in Biochemistry and Biophysics] No 3, Jun 79 pp 59-66

ABSTRACT: The author reports a computer simulation of certain "vision invariability" of human beings and certain animals to help clarifying the mechanism of information processing of the visual system. The simulation involves the use of a general electronic computer model TQ-16 to extract such characteristics as marginal numbers, inner angles and marginal lengths from the contours of each connecting regions for recognition and classification of polygons of variable sizes and orientations. By slight correction of the program, it can also find unknown simple objects and its location. Despite its fastness and simplicity, it applies only to picture bearings of certain assigned angle of rotation.

This paper was received for publication on 9 January 1979.

AUTHORS: QIAN Mingping [6929 2404 1627]
CHEN Quanjuan [7115 0278 3197]

ORG: QIAN of Beijing University, and CHEN of Fifth Laboratory of Institute of Biophysics of Chinese Academy of Sciences

TITLE: "Cancer Cell Recognition by the Fuzzy Method"

SOURCE: Beijing SHENGWUHUAXUE YU SHENGWUWULI JINZHAN [Progress in Biochemistry and Biophysics] No 3, Jun 79 pp 66-71

ABSTRACT: The authors report the utilization of the fuzzy set method for the recognition of the patterns of cancer cells and some of the results obtained. The method includes the selection of seven characteristic symptoms of squamous epithelial single cancer cells as standards, and then subjected the specimens in question to a series of repeated parameter and mathematical model corrections, until the numbers match those of the standards. The method is claimed to be fast, effective and valuable to cancer diagnostic references.

Thanks are expressed to Prof. Cheng Minde [4453 3046 1795] and Shen Xiechang [3088 3610 2490], both of Department of Mathematics of Beijing University, for directing the research.

This paper was received for publication on 9 January 1979.

AUTHORS: BAO Yiheng [7637 5030 1854]
CHEN Yunjun [7115 0061 0193]

ORG: Both of Fifth Laboratory, Institute of Biophysics, Chinese Academy of Sciences

TITLE: "Microstructure of Gecko gecko Retina and Submicrostructure of Its Light Receptive Cells"

SOURCE: Beijing SHENGWUHUAXUE YU SHENGWUMULI JINZHAN [Progress in Biochemistry and Biophysics] No 3, Jun 79 pp 71-74

ABSTRACT: Optical microscopic and electronic microscopic study on the microstructure of Gecko gecko retina and the submicrostructure of its light receptive cells shows that the visual cells are consisted entirely of visual rod cells with large columned outer sections, the number of which is much more than those of most diurnal and nocturnal animals. Also, although its habit seems to be nocturnal, its retina possesses also those of diurnal animals, which tends to indicate that, in the process of changing from diurnal to nocturnal habits, it still retains the fundamental diurnal visual structure, despite the replacement of pyramidal visual cells by rod visual cells.
This paper was received for publication on 20 September 1978.

AUTHORS: CHEN Yunjun [7115 0061 0193]
BAO Yiheng [7637 5030 1854]

ORG: Both of Fifth Laboratory, Institute of Biophysics, Chinese Academy of Sciences

TITLE: "Preliminary Observation on the Microstructure of Owls (Bubo Bubo Kiautschensis and Ninox Scutulata Ussuriensis) Retina, and the Submicrostructure of Its Light Receptive Cells"

SOURCE: Beijing SHENGWUHUAXUE YU SHENGWUMULI JINZHAN [Progress in Biochemistry and Biophysics] No 3, Jun 79 pp 75-76, 38

ABSTRACT: Optical microscopic and electronic microscopic study on the microstructure of Bubo Bubo Kiautschensis and Ninox Scutulata Ussuriensis (two species of owls in China) retina, and the submicrostructure of its light receptive cells reveals the following characteristics, namely:
1) visual rod cells are distinctly dominant among the light receptive cells, with the total outer membrane area larger than the visual cones;
2) the number of rod cells far surpasses that of ganglionic cells; 3) unlike other fowls, the visual cone of owls has only one type of morphology; and 4) various forms of mitochondria are concentrated at the edge of the sclera forming ellipsoids. This paper received on 20 September 1978.

AUTHORS: WU Shixiang [0702 2514 4382]
ZHAO Dandan [6392 0030 0030]
ZOU Gang [6760 1481]

ORG: All of Shanghai Institute of Pharmacology, Chinese Academy of Sciences

TITLE: "Isolated Guinea Pig Ileum Biological Identification of Endorphin, and Introduction of a Simple Converter"

SOURCE: Beijing SHENGWUHUAXUE YU SHENGWUWULI JINZHAN [Progress in Biochemistry and Biophysics] No 3, Jun 79 pp 77-79

ABSTRACT: To coordinate the biological identification and eventual isolation of endorphin from isolated guinea pig ileum's transverse muscles, the authors introduce the construction, performance and characteristics of a self-developed converter apparatus that will convert the very weak muscular contraction energy of isolated guinea pig ileum's transverse muscles into electric energy for final output to a recorder. After two years of use, the apparatus has proved to be sensitive, stable and dependable.

This paper was received for publication on 11 February 1978.

AUTHOR: ZHAO Yunjuan [6392 0061 1227]

ORG: This Journal

TITLE: "Convention News Briefs"

SOURCE: Beijing SHENGWUHUAXUE YU SHENGWUWULI JINZHAN [Progress in Biochemistry and Biophysics] No 3, Jun 79 p 81

ABSTRACT: This news brief reports the convening of a Biological Membrane Convention, sponsored by the Chinese Academy of Sciences, on 7-15 March 1979 at Beijing, and attended by more than 90 representatives from various concerned units. In addition to reports on 48 research papers, there were also 24 reviews on biological membrane research and newer techniques in China and abroad, and special discussions on such subjects as "Energy Conversion on Biological Membranes", "Structure and Function of Cell Surfaces", as well as demonstrations of some commonly interested newer techniques.

11,206
CSO: 4009

ENGINEERING

AUTHOR: TANG Limin [0781 4539 3046]

ORG: Institute of Engineering Mechanics

TITLE: "Basic Problems of Finite Element Method"

SOURCE: Dalian DALIAN GONGXUEYUAN XUEBAO [JOURNAL OF DAIREN ENGINEERING INSTITUTE] in Chinese No 2, Jun 79 pp 1-15

TEXT OF ENGLISH ABSTRACT: This paper summarizes the concepts and operations of the so-called Discretized Operator Method from which the weighted residual method and variational method of finite element can be deduced thereafter.

The explicit algebraic forms of discretized operators as difference patterns are given so that some interrelationships between difference method and finite element method can be seen. And the discretization errors and the concepts and criteria of "convergence in dynamic (gross) sense" are also shown.

The present paper shows how to construct the so-called "Quasi-conforming Element" for a new approach to the conforming problem. Moreover, the "variational crime" of hybrid model has also been discussed.

[Continuation of DALIAN GONGXUEYUAN XUEBAO, No 2, Jun 79 pp 1-15]

Received November 1978.

AUTHOR: CHEN Wanji [7115 5502 0679]

ORG: Institute of Engineering Mechanics

TITLE: "Analysis of Elastic Contact Problems by Mixed Approach Using Finite Element Methods"

SOURCE: Dalian DALIAN GONGXUEYUAN XUEBAO [JOURNAL OF DAIREN ENGINEERING INSTITUTE] in Chinese No 2, Jun 79 pp 16-28

TEXT OF ENGLISH ABSTRACT: This paper deals with elastic contact problems, which belong to category of geometrical nonlinearity with small deformation. The nonlinearity of elastic contact problems is due to the contact conditions of the points contacted.

The mixed approach suggested by this paper are suited for solving the local nonlinear problems. The general ideas of this mixed approach using F. E. M. are as follows: after the discretization of elastic bodies, according to the displacement field assumed, we can get the stiffness matrix of elastic bodies, thus the matrix of influence coefficients of contact stress at the contacting boundaries can be determined, further more regarding the contact stresses as unknown variables, the compatibility conditions at contact boundaries then were given. As a matter of fact, we thus performed a procedure which localized the nonlinearity of the

[Continuation of DALIAN GONGXUEYUAN XUEBAO, No 2, Jun 79 pp 16-28]

problem.

Calculations point out that quite evident effects both in computational speed and storage saving are obtained by mixed approach of this paper comparing with general Finite Element Methods.

Received October 1978.

AUTHOR: SUN Huanchun [1327 3562 4783]

ORG: Institute of Engineering Mechanics

TITLE: Elasto-plastic Analysis of a Plane Frame"

SOURCE: Dalian DALIAN GONGXUEYUAN XUEBAO [JOURNAL OF DAIREN ENGINEERING INSTITUTE] in Chinese No 2, Jun 79 pp 29-40

TEXT OF ENGLISH ABSTRACT: In this paper, a method of piece-wise linear analysis of a reinforced concrete frame is proposed. By means of this method, the behaviors of the reinforced concrete frame in various ranges (elastic, cracking and plastic) can be analyzed, in which the stiffness degradation due to the cracks and plastic hinges generated under the actions of the gradually increasing basic horizontal loads is taken into consideration. These basic horizontal loads are estimated according to the Architectural Earthquake Resistant Design Code (TJ11-74) of the PRC or the specific method described in this paper, and increased gradually in the same proportion through the analysis. In this paper the order of occurrence of cracks and plastic hinges in beams and columns, the maximum elasto-plastic horizontal displacement of each story of the frame, the limit resistant capacity of the frame and the coefficient of ductility of each story of the frame etc. are calculated as examples.

[Continuation of DALIAN GONGXUEYUAN XUEBAO, No 2, Jun 79 pp 29-40]

Received November 1978.

AUTHOR: LIN Jiahao [2651 1367 3185]
DING Dianming [0002 3013 2494]
TIAN Yushan [3944 3768 1472]

ORG: All of Institute of Engineering Mechanics

TITLE: "Analysis of Elasto-plastic Earthquake Response of Series Multi-Degree-of-Freedom Systems"

SOURCE: Dalian DALIAN GONGXUEYUAN XUEBAO [JOURNAL OF DAIREN ENGINEERING INSTITUTE] in Chinese No 2, Jun 79 pp 41-53

TEXT OF ENGLISH ABSTRACT: This paper presents an analysis of earthquake response for series multi-degree-of-freedom systems under the action of seismic waves. Two different types of force-deflection relations are considered: one of them is bilinear type and the other is trilinear one (where the effect of stiffness-degrading is also taken into consideration). A method for coding the computer program is presented in which the logic structure of the program organization and the concerned formulas are based on a phase-identifying-value PD. Wilson-theta method has been proved effective in the step-by-step integration of the equations of motion.

Some examples of practical structures after earthquake disaster are given, and

[Continuation of DALIAN GONGXUEYUAN XUEBAO, No 2, Jun 79 pp 41-53]

some problems in the analysis are discussed.

Received November 1978.

AUTHOR: NI Hangen [0242 3352 2704]

ORG: Seismic Control Research Laboratory, Institute of Hydraulic Engineering

TITLE: "Earthquake Resistant Behavior of a Concrete Dam"

SOURCE: Dalian DALIAN GONGXUEYUAN XUEBAO [JOURNAL OF DAIREN ENGINEERING INSTITUTE] in Chinese No 2, Jun 79 pp 54-66

TEXT OF ENGLISH ABSTRACT: The dynamic behavior of a concrete dam during earthquake is determined by the gelatin dynamic model test, gypsous dynamic model test, random vibration analysis of the field observations and the finite element computations. These results are fairly consistent in regard to natural frequencies, mode shapes and dynamic stresses. Formulas are presented for the determination of the natural frequencies, mode shapes and the stresses of the dam with reservoir full.

Received 16 January 1979.

AUTHOR: ZHAO Guofan [6392 0948 5672]
GAO Junsheng [7559 0193 0581]
LIAO Wangqing [1675 1238 0615]
WANG Qingxiang [3769 3237 3276]

ORG: All of the Structural Research Laboratory, Institute of Ocean Engineering

TITLE: "Study on the Cracking Strength and Maximum Crack Width in Reinforced Concrete Members"

SOURCE: Dalian DALIAN GONGXUEYUAN XUEBAO [JOURNAL OF DAIREN ENGINEERING INSTITUTE] in Chinese No 2, Jun 79 pp 67-80

TEXT OF ENGLISH ABSTRACT: This paper reviews the existing methods for calculating the cracking strength and crack width in reinforced concrete members.

Based on the tests carried out in Dalian Engineering Institute, the equations for calculating the cracking strength in reinforced concrete members are proposed. The parameter γ involved in the equations is related to the shape and height of the section and also to the loading characteristics, and its value is given by

$$\gamma = \alpha \omega_n$$

where

$$\alpha_A = 0.82 + \frac{5.0}{h \left(1 + \frac{r_s}{a_s} \right)},$$

and r_s is taken from reference (14).

On the basis of statistical analysis of test data, the equation for the prediction of maximum crack width in reinforced concrete members subjected to bending, axial tension or eccentric loading, is proposed as follows:

$$\sigma_{fmax} = C_1 C_2 C_3 \frac{\sigma_s - \sigma_s}{E_s} \left(\frac{30 + d}{0.28 + 10\mu} \right).$$

The proposed equations have been verified in close agreement with test data.

Received 8 February 1979.

AUTHOR: DENG Zhaohao [6772 5128 6275]
FANG Dacheng [2455 1129 2052]
LIU Guangfei [0491 1684 7378]
LI Fuquan [2621 4395 0356]
CHENG Ji [4453 7535]
HUANG Qirui [7806 0366 3843]
LIU Deming [0491 1795 2494]
XU Anshun [1776 1344 7311]
WANG Peichen [3769 0160 5256] et al.

ORG: DENG, FANG, LI, CHENG and LIU Guangfei of Research Group on Casting Solidification, Dalian Engineering Institute; HUANG, XU, WANG and LIU Deming of Dalian Shipyard

TITLE: "On the Solidification and the Casting Defects Formation of Large Al-Mn-Brass Propellers"

SOURCE: Dalian DALIAN GONGXUEYUAN XUEBAO [JOURNAL OF DALIEN ENGINEERING INSTITUTE] in Chinese No 2, Jun 79 pp 81-98

TEXT OF ENGLISH ABSTRACT: Oxide inclusions, oxide shuts and contraction cracks are the main casting defects of large marine propellers ($\phi 5000$ mm, gross weight

[Continuation of DALIAN GONGXUEYUAN XUEBAO, No 2, Jun 79 pp 81-98]

~ 20 $\bar{3}$).

Investigations of the formation of the defects were carried out both in production scale and in the laboratory.

Temperature measurements with thermocouples show that the propeller solidifies directionally from the tip of the blade to the boss and the riser solidifies finally. And the rim part of the blade begins to solidify immediately after being filled.

The flow pattern of the liquid metal in the mold was investigated through a scale model (Froude model). The mathematical relationship to realize the analog simulation is $V_m = (1/3.5) V_p$, where V_m and V_p are the corresponding velocities of the fluids in the model and in the prototype.

The cracking tendency of the Al-Mn-brass subjected to thermal stress was investigated through a test bar with different diameters solidifying and cooling under constrained condition.

Results of both the above experiments and the measures taken in production scale

[Continuation of DALIAN GONGXUEYUAN XUEBAO, No 2, Jun 79 pp 81-98]

to eliminate the casting defects show that the oxide and dross inclusions formed during pouring are the primary cause of the casting defects and the thermal stress developed after solidification tears up the metal along the oxide inclusions. And the directional solidification of the propeller favors the development of the thermal stress.

SUN Jun [1327 0689], KONG Xianhua [1313 2009 5363], WANG Yikun [3769 1355 0981], and LIU Fuyi [0491 4395 5030] of the Dalian Engineering Institute took part in experimentation.

Received 17 January 1979.

AUTHOR: YUAN Jingxia /5913 2529 0204/
FENG Xinan /7458 6580 1344/
WEI Zhaozheng /7614 0340 2973/

ORG: All of the Laboratory of Precision Machine Tools and Precision Techniques

TITLE: "Calculation of Vibration of Structural Elements of a Machine Tool by Means of Finite Element Method of Subspace Iteration"

SOURCE: Dalian DALIAN GONGXUEYUAN XUEBAO /JOURNAL OF DAIREN ENGINEERING INSTITUTE/ in Chinese No 2, Jun 79 pp 99-106

TEXT OF ENGLISH ABSTRACT: In this paper, the basic principles and main features of a universal computer program using finite element method of subspace iteration to calculate structural elements of a machine tool are introduced. During the calculation, the structural elements are regarded as a box-type structure made up of thin flat plates. For checking the computed accuracy obtained from this program, the resonance frequencies and modes of a cantilever beam divided into meshes with different fineness are calculated and compared with the accurate solution obtained from analytical approach. The computed results about the resonance frequencies, modes and forced vibration regardless of damping in a cross-beam of numerical control planomilling machine are also introduced.

/Continuation of DALIAN GONGXUEYUAN XUEBAO, No 2, Jun 79 pp 99-106/

Received 8 January 1979.

AUTHOR: PENG Xinan [7458 6580 1344]

ORG: Laboratory of Precision Machine Tools and Precision Techniques

TITLE: "The Method for Calculating the Coordinates of Shaft Centers of a Multiple-spindle Gear Box in the Aggregate Machine With an Electronic Computer"

SOURCE: Dalian DALIAN GONGXUEYUAN XUEBAO [JOURNAL OF DAIREN ENGINEERING INSTITUTE] in Chinese No 2, Jun 79 pp 107-117

TEXT OF ENGLISH ABSTRACT: This paper introduces the principle of the operation and application of a source program for calculating coordinates of shaft centers of a multiple-spindle gear box in the aggregate machine by means of an electronic computer. The feature of this program offers the possibility of automatically selecting the calculating process and method of the coordinates of shaft centers. As a result of this, it saves a lot of time and makes the work easier for preparing the input data. It is convenient for a designer to handle and make use of it. In this paper the analysis of possible mistakes in calculation and the approach to finding mistakes with the help of the source program are discussed.

Received 23 December 1978.

AUTHOR: WANG Rongsheng [3769 2837 3932]
XIA Zunquan [1115 1415 6898]

ORG: WANG of Department of Shipbuilding, Dalian Engineering Institute; XIA of Department of Mathematics, Dalian Engineering Institute

TITLE: "Mathematical Simulation of Performance of a Diesel Engine"

SOURCE: Dalian DALIAN GONGXUEYUAN XUEBAO [JOURNAL OF DAIREN ENGINEERING INSTITUTE] in Chinese No 2, Jun 79 pp 118-132

TEXT OF ENGLISH ABSTRACT: This paper presents a description of a mathematical simulation of the turbocharged two-stroke diesel engine. The differential equations of the process are derived and the mathematical models of all thermodynamic systems are given. The burning rate is calculated according to the data of the heat release obtained from the pressure-time diagram with the Lagrange interpolation formula. The instantaneous heat transfer in cylinder is calculated by the empirical correlation given by Woschni. In the displacement scavenging model the effect of the short circuiting is considered. The process occurring in the exhaust manifold is computed by the model for filling and emptying process. The turbocharger turbine is analyzed on a quasi-steady basis with given mass flow-expansion ratio characteristics and efficiency-velocity ratio curves. Steady flow is assumed and experimental performance is

Continuation of DALIAN GONGXUEYUAN XUEBAO, No 2, Jun 79 pp 118-132

used to model the compressor. For the solution of differential equations on digital computer, the predictor-corrector method is combined with Wegstein method.

Received 13 January 1979.

AUTHOR: SHEN Shaoxin 3088 4801 02C7

ORG: Microelectronics Teaching and Research Laboratory, Dalian Engineering Institute

TITLE: "Testing Research on Electrostatic Amplifiers TGYS-7601"

SOURCE: Dalian DALIAN GONGXUEYUAN XUEBAO JOURNAL OF DAIREN ENGINEERING INSTITUTE in Chinese No 2, Jun 79 pp 133-147

TEXT OF ENGLISH ABSTRACT: In this paper, the principle and circuits of the linear operational amplifier to use the variodes for modulator is analyzed and some questions in application are investigated.

The achievements have been discriminated through the chemical industry branch and have been used in some industrial gas chromatography instruments in China.

Received 12 February 1979.

AUTHOR: None

ORG: Department of Chemical Engineering, Dalian Engineering Institute; Chemical Engineering Institute, Luda

TITLE: "Laboratory Test on the Combined Process of Extracting Potassium From Sea-water With Zeolite and Hot Cyclic Method of Soda Manufacture"

SOURCE: Dalian DALIAN GONGXUEYUAN XUEBAO [JOURNAL OF DAIREN ENGINEERING INSTITUTE] in Chinese No 2, Jun 79 pp 148-163

TEXT OF ENGLISH ABSTRACT: In this paper, a novel process for extraction of potassium from sea-water at constant temperature with the Chinese natural zeolite as adsorbent is described.

The result is as follows: both 3.5 N NH_4Cl and mixed NH_4Cl - NaCl solution (NH_4Cl 3.5 N, NaCl 2.8 N) are effective scrubbing agents of K^+ , but the NH_4^+ -type zeolite or else the quantity of NH_4^+ which is carried away by sea-water would be too great. In order to depress the loss of ammonia, technological experiments are conducted to test the effects of modification methods of zeolite: single stages modification with different ratio of scrubbing agent and modifying agent. An effective process for depressing ammonia loss at constant temperature have been obtained, when natural zeolite used as K^+ adsorbent at constant temperature, the

[Continuation of DALIAN GONGXUEYUAN XUEBAO, No 2, Jun 79 pp 148-163]

NaHCO_3 mother liquid of Solvay-soda process, after stripping off NH_3 , may be taken as scrubbing agent. Extraction of potassium is combined with hot ammonium chloride process, such technological scheme is rational from the standpoint of economics and technology. The main technical characteristics are: effective adsorption capacity of K^+ by zeolite = 13 kg K^+ /ton; production rate of zeolite = 0.271 kg K^+ /ton hour; ammonia loss is dependent upon the ratio of the quantity of extracted K^+ and Na_2CO_3 is varied from 5 to 59 kg NH_3 /ton $\cdot \text{KCl}$; scrubbed solution K^+ varied from 19 to 20 g/l; composition of mixed NH_4Cl - KCl fertilizer is $\text{NH}_4\text{Cl}:\text{KCl} = 3.17 \sim 3.27:1$.

CHEN Yuchen [7115 3022 3819] and XIU Lixian [0208 4539 7359] wrote the paper.

Received 7 February 1979.

AUTHOR: ZONG Zhenglan /1350 6297 5695/
CHEN Yushen /7115 3022 3819/
ZHENG Xiyong /6774 6932 5255/

ORG: All of Laboratory of Chemical Engineering

TITLE: "Phase Equilibria of Alcoholic Solutions"

SOURCE: Dalian DALIAN GONGXUEYUAN XUEBAO /JOURNAL OF DAIREN ENGINEERING INSTITUTE/ in Chinese No 2, Jun 79 pp 164-173

ABSTRACT: Investigating phase equilibrium of alcoholic solutions will promote advances in associated liquid theory. In this paper, the Gillespie model gas-liquid equilibrium device is applied to determine the gas-liquid equilibrium data of three systems of tertiary butyl alcohol--secondary butyl alcohol, secondary butyl alcohol--normal butyl alcohol, and tertiary butyl alcohol--secondary butyl alcohol--normal butyl alcohol. The Pratt model equilibrium device is used to determine the limited miscibilities of three systems of water--normal butyl alcohol, water--isobutyl alcohol, and water--isoamyl alcohol. By applying the modified Wilson equation to these experimental data, the paired energy parameters can be derived, to a certain precision, in fulfilling the requirements of engineering design. Using the derived paired energy parameters, the gas-liquid equilibrium relationship of a three-element system of tertiary

/Continuation of DALIAN GONGXUEYUAN XUEBAO, No 2, Jun 79 pp 164-173/

butyl alcohol--secondary butyl alcohol--normal butyl alcohol can be calculated for comparison with the experimental data. Thus, a better parallel effect can be realized.

Received 22 February 1979.

AUTHOR: WEI Defu [7614 1795 1318]

ORG: Laboratory of Chemical Engineering

TITLE: "An Automatic Analyzer for Microdetermination of Dissolved Oxygen in Water"

SOURCE: Dalian DALIAN GONGXUEYUAN XUEBAO [JOURNAL OF DAIREN ENGINEERING INSTITUTE] in Chinese No 2, Jun 79 pp 174-175

ABSTRACT: In industrial production, after degasification generally the amount of dissolved oxygen in fresh or sea water drops below 10 ppb. So microdetermination of dissolved oxygen is very important. In a 1977 study of the desalinization of sea water, a spiral tube type parallel flow gas-water contact device was built. The precision of the device is 60 to 100 μ V/ppb of dissolved oxygen, corresponding to 3 to 3.5 mm reading/ppb. The oxygen content is continuously analyzed by a Pb /KOH/ Ag primary cell. The standard error of the device is less than +5 percent. The study was completed with the cooperation of Chemical Engineering Laboratory and Dalian Guangming Chemical Engineering Institute, assisted by the Organic Chemistry Teaching and Research Laboratory, Dalian Engineering Institute.

Received 12 February 1979.

10424
CSO: 4009

MICROBIOLOGY

AUTHORS: ZHANG Meiching [1728 5019 1987]
DING Anlin [0002 1344 2651]

ORG: Both of Beijing Academy of Agricultural Sciences

TITLE: "Study on Phosphate Bacterial Fertilizers"

SOURCE: Beijing WEISHENGWUXUE TONGBAO [Microbiology Bulletin] Vol 6
No 3, Jun 79 pp 1-4

ABSTRACT: Reporting a study on the optimal conditions for the application of phosphate bacterial fertilizer to cope with the phosphate-deficient Beijing soils since 1973, the authors conclude that soil moisture should be around 20%, that the temperature should be 25-35°C, or early wheat sowing is preferred to late wheat sowing, and that such insecticides as Logo, TEPP, etc. and ammonium sulfate fertilizer are inhibitory, and should not be mixed with the application. It is found also that phosphate bacteria produces organic acids that acidify the soil, and consequently phosphorolysis. The materials used in the study are *Bacillus megatherium phosphaticum* and 832 or *Pseudomonas* sp. that contain growth stimulating hormones, but are inhibited by some bacteria in the soil.

[Continuation of WEISHENGWUXUE TONGBAO Vol 6 No 3, Jun 79 pp 1-4]

Huang Deming [7806 1795 24942, Miao Lanzhung [5379 5696 0022], Zhang Chunmei [1728 2504 2734], Sun Yunfu [1327 0336 4395] and Yu Ching [0060 7230] also participated in the research.

Yen Sunchu [7051 6676 0443] and Chen Chingtao [7115 1987 3447], both of the Institute of Microbiology of the Chinese Academy of Sciences, assisted in the identification of Actinomyces and Fungus. Wang Dasi (3769 1129 5091) directed the bacterial isolation.

AUTHORS: LIANG Zongchi [2733 1350 3823]
CHEN Yuepi [7115 2588 4310]
LIU Aiyang [0491 1947 5391]
WANG Nailiang [3769 1698 0081]

ORG: All of Guizhou Agricultural College

TITLE: "A Preliminary Study on *Isaria* -- An Entomophytic Fungus"

SOURCE: Beijing WEISHENGWUXUE TONGBAO [Microbiology Bulletin] Vol 6
No 3, Jun 79 pp 4-7

ABSTRACT: The author reports the isolation from such common tea tree pests as *Buzura thibetaria*, *Scopula subunctaria*, *Euproctis pseudoconsersa*, *Adoxophyes priuatana* and *Dasychira balbarana* six strains of *Isaria*, all characterized by their sporodochia formation from pupa bodies. A comparison of the culture characteristics, individualistic morphology, insect hosts and symptoms of the isolated entomophytic fungus against those of *Isaria cicadae* and *Isaria farinosa*, identified them as a near species of *Isaria cicadae* Miq. numbered 1401,402. It is found also that the presence or absence, size and morphology of the sporodochia varies much with the composition of the culture medium and moisture, while addition of 1% protein gel or 0.5% glycerin increases their pathogenicity.

[Continuation of WEISHENGWUXUE TONGBAO Vol 6 No 3, Jun 79 pp 4-7]

Xia Huaien [1115 2037 1869], Xia Shamei [1115 4801 3270] and Wang Taihua [3769 1132 5478] of the Meitan Institute of Tea Science participated in the collection of specimens. Xia Huaien also identified the pathogenic insects.

AUTHORS: QIU Yisan [6726 4135 0005]
CHEN Zhiyuan [7115 5347 1254]

ORG: Both of Jiangsu Yencheng District May 7 Agricultural University

TITLE: "Study on the Application Technique of Entomophthora aphidis Preparations"

SOURCE: Beijing WEISHENGWUXUE TONGBAO (Microbiology Bulletin.) Vol 6
No 3, Jun 79 pp 7-9

ABSTRACT: This study on the application technique of Entomophthora aphidis preparation against aphids concludes that: 1) application under high humidity and higher temperature is more effective; 2) addition of an appropriate amount of water to the germination process, and applying the preparation after spore germination will shorten the time of infection, and counter the unfavorable effect of low temperature and low humidity; 3) the usual practice of applying the preparation after 24 hours' soaking should be avoided when the temperature is high; 4) application of 50 times diluted bran cultured preparation will strengthen its adherence; and 5) addition of laundry detergent as adherence agent seems unnecessary.

[Continuation of WEISHENGWUXUE TONGBAO Vol 6 No 3, Jun 79 pp 7-9]

Prof. Ni Tungxin [0242 0681 2450] and classmates Xu Bingxian [1776 3521 6343], Li Yushan [2621 3022 3790] and Miao Futai [5379 0102 3141] participated in part of the research.

AUTHORS: WU Songgang [0702 2646 0474]
XU Yanping [6079 5333 5493]
WU Zhiping [0702 5365 5493]
QI Xiaoyu [2058 2556 3768]
HAO Jiaqi [6787 1367 7496]
YU Ping [5713 5493]
ZHANG Yuanhui [1728 3293 8409]
BAO Yunsen [7637 6663 2773]

ORG: All of Shanxi Institute of Biology, Taiyuan

TITLE: "Selective Breeding and Production Application of Griseofulvin-Producing White *Penicillium patulum* Mutant Strain B-53"

SOURCE: Beijing WEISHENGWUXUE TONGBAO [Microbiology Bulletin] Vol 6 No 3, Jun 79 pp 10-12

ABSTRACT: The authors report the obtainment of a white *Penicillium patulum* mutant strain B-53 after 6 to 13 generations of continuous artificial induction, using UV + LiCl instead of lactose and corn syrup as the induction agent, and *Penicillium patulum* 4541 as the starting strain. The metabolism product of the white mutant strain B-53 was proved by UV spectrum, IR spectrum and paramagnetic resonance spectrum to be

[Continuation of WEISHENGWUXUE TONGBAO Vol 6 No 3, Jun 79 pp 10-12]

identical to griseofulvin. Besides its characteristic stability, the yield of the 13th generations is almost 60 times higher than that of the present process. Its adoption to the production at Nantung Biochemical Preparations Plant in 1978 has proved that the fermentation unit has increased 217%, and food consumption has reduced 31% from that of 1977.

This research was directed by Sung Yuli [1345 2589 4409] of the Shanghai Institute of Medical Industry, and participated also by the Jiangsu Nantung Biochemical Pharmaceutical Plant, and the Shanxi TaiyuanCondiment Plant.

Qi Zuxiong [7871 4371 9227] of the Institute of Microbiology of the Chinese Academy of Sciences made the identification.

AUTHORS: HAN Baoling [7281 1405 3781]
TAN Suqin [6223 4790 3830]
YU Yiqiang [0060 4135 1730]
YAO Entai [1202 1869 3141]

ORG: All of Department of Antibiotics, Institute of Pharmacology, Chinese Academy of Sciences

TITLE: "Study on the Fermentation Conditions of Antibiotics 3719"

SOURCE: Beijing WEISHENGWUXUE TONGBAO [Microbiology Bulletin] Vol 6
No 3, Jun 79 pp 13-16

ABSTRACT: To increase the yield of antibiotics 3719's fermentation for more extensive supply to the therapy of ear and kidney diseases, the authors report a series of experiments that established the following optimal conditions for the fermentation, namely: 1) temperature of fermentation 32°C; 2) ratio of cultural medium of glucose; starch; bean meal = 1: 2: 2.5; 3) antibiotic synthesis starts from 72 hours after the fermentation started; 4) addition of 5% glucose solution at the 72 and 96 hours period can raise the fermentation unit from 2890 µg/ml to 4042.5 µg/ml; and 5) dilution with bacteria-free water can raise the fermentation unit further by 11%.

AUTHOR: None

ORG: Cellulase Research Group, Institute of Microbiology, Chinese Academy of Sciences

TITLE: "Experiments on the Enzymolysis of Saw Dust by Cellulase Produced from *Trichoderma koningi*"

SOURCE: Beijing WEISHENGWUXUE TONGBAO [Microbiology Bulletin] Vol 6
No 3, Jun 79 pp 16-21

ABSTRACT: This article reports a series of experiments that established the following optimal conditions for the cellulase enzymolysis of saw dust, namely: 1) raw materials: *Guglans mandshurica*, *Populus*, *Phellodendron amurense* Rupr and Birch as carbon source, protein jel as nitrogen source, and culture medium at pH 6.0-6.5; 2) condition of cellulase enzymolysis: 40-50°C temperature, pH 4.5-5.0, 60 hours time, 5:1 enzyme ratio, 10% substrate concentration, and up to 15 days storage at 18-22°C; 3) Birch has highest cellulase conversion; and 4) condition of culture: ventilation at 1:0.5 and stirring velocity at 250 rotation/minute.

AUTHOR: WU Jiaju [0702 1367 7467]

ORG: Hubei Shashi City Epidemic Control Station

TITLE: "Rhubarb Anthraquinonide Destruction of Intestinal Virus"

SOURCE: Beijing WEISHENGWUXUE TONGBAO [Microbiology Bulletin] Vol 6
No 3, Jun 79 pp 21-24

ABSTRACT: In perance to a 1975 discovery that the traditional Chinese medical herb rhubarb (*Rheum officinale*, Baill.) has very strong destructive effect against intestinal viruses, the author reports a series of experiments that confirm that free anthraquinonide extracted from rhubarb has very strong effect on many types of intestinal viruses, while free anthraquinone has no such effect. It is reported also that such other traditional Chinese medical herbs as *Heshouwu* (*Polygonum multiflorum*, Thunb.) and *Huzhangzhung* (*Polygonum caspidatum* S. et Z.) that are noted for their similar effect, contain also anthraquinonide. It is suggested therefore that these discovery many be in correspondence to reports abroad of many action of nucleosides against viruses.

AUTHORS: BAI Changlo [4101 1603 2867]
LU Shichu [4151 2562 0443]

ORG: Both of Chinese Liberation Army's 305 Hospital, Beijing

TITLE: "Certain Characteristics of *Bacillus Nianqiu*"

SOURCE: Beijing WEISHENGWUXUE TONGBAO [Microbiology Bulletin] Vol 6
No 3, Jun 79 pp 24-27

ABSTRACT: The authors report the isolation and identification of 17 strains of Gram negative *Bacillus Nianqiu* from the clinical phlegm, burns, cut surface and urea specimens of the hospital from 1973 to 1974. On the basis that 8 strains are identified as nitrate negative, and 9 strains that include 2 strains of *Mima polymorpha* var. *oxidans* are identified as nonsaccharolytic, their respective morphology, cultural and growth characteristics over different differential mediums, biochemical characteristics, and sensitivity to some antibiotics are identified and described. Because of the international confusion over their nomenclature, the name *Bacillus Nianqiu* (adhesive balls), proposed by the Beijing Microbiology Society to the Microbiology Society of China, is adopted here.

AUTHORS: LI Yubing [2621 3768 0393]
WU Zhsengqiang [0702 2182 1730]
CHEN Huaizhen [7115 2037 3791]
LIANG Lizhen [2733 7787 6297]
SHEN Guizhang [3088 2710 4545]
WU Chengwen [0702 2110 2429]

ORG: LI, WU, CHEN and LIANG all of Guangdong Pharmacological College, and
SHEN and WU both of Guangdong Province Epidemic Control Station

TITLE: "Experiment of the Inhibition Effect of the Huanglung Compound
on Type A₃ Influenza Virus"

SOURCE: Beijing WEISHENGWUXUE TONGBAO [Microbiology Bulletin] Vol 6
No 3, Jun 79 pp 27-28, 48

ABSTRACT: In view of the proven effectiveness of the Huanglung compound
draft or tablets as a therapy or prophylactics against type A₃ influenza
since 1971, a study is reportedly conducted on their effect on chicken
embryo previously injected with different doses of EID₅₀ type A₃ virus.
It is concluded that the compound definitely inhibits the multiplication
and cell infection of the virus, as well as prevents the adsorption and
penetration of the virus, directly related to the concentration of the

[Continuation of WEISHENGWUXUE TONGBAO Vol 6 No 3, Jun 79 pp 27-28,48]

compound. The compound is prepared mainly from leaves of Clausena
Wampi, Oliv., leaves of Nephelium Longana, Camb., Elsholtria patrini,
Garcke., and others, the formula and method of preparation of which are
described.

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TITLE: "Advances in Micromonospora and Its Antibiotics-Producing Research"

SOURCE: Beijing WEISHENGWUXUE TONGBAO [Microbiology Bulletin] Vol 6
No 3, Jun 79 pp 29-37

ABSTRACT: The authors review recent advances in microminispora and its antibiotics-producing research that includes the discovery and clarification of its chemical structure of gentamicin for the treatment of Gram negative bacterial influenza, the finding of ever-increasing numbers of new aminoglucoside type antibiotics, and induced new mutant antibiotic strains from gentamicin, the conversion of secondary gentamicin components into gentamicin C compounds, and the addition or control of 2-deoxystreptoamides of varying structures into gentamicin structures to obtain specifically-demanded new antibiotics.

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TITLE: "Biological Characteristics of Cryptococcus neoformans and Methods of Its Microbiological Examinations"

SOURCE: Beijing WEISHENGWUXUE TONGBAO [Microbiology Bulletin] Vol 6
No 3, Jun 79 pp 37-41

ABSTRACT: Following a review on the biological characteristics of Cryptococcus neoformans with regard to morphological structures, culture, biochemical characteristics, pathogenicity, types, antigenicity, immunity and antibiotic reactions, the authors introduce the methods for their microbiological examination that include isolation identification methods by ink stains, culture and mouse inoculation, lyo-antigen examination methods, and antigen examination methods. Of the above, the ink stain isolation identification methods, the Sabouraud medium culture method, and the reverse coagulation test for lyo-antigen method are recommended.

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TITLE: "Application Techniques of Electron Microscopy in Microbiological Research"

SOURCE: Beijing WEISHENGWUXUE TONGBAO [Microbiology Bulletin] Vol 6
No 3, Jun 79 pp 42-46

ABSTRACT: The author introduces some electron microscopical techniques that are now being commonly adopted in modern microbiological research. The techniques introduced include: 1) microtomic slicing; 2) negative staining; 3) freeze etching; 4) observation of living specimens; 5) preparation of specimens for immuno-electron microscopy; and 6) preparation of specimens for scanning electron microscopy.

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TITLE: "Isolation of Polygonal Virus from Trichoplusia ni (Hubner)"

SOURCE: Beijing WEISHENGWUXUE TONGBAO [Microbiology Bulletin] Vol 6
No 3, Jun 79 p 47

ABSTRACT: This newsbrief reports a three year study on the polygonal virus that infected and killed naturally the larvae of Trichoplusia ni (Hubner), a common rape turnip, cabbage, cotton and tomato pest. The study reveals that: 1) the mortality of the pest larvae can be as high as 90%, and the peak season is August; 2) the color of the infected larvae changes from greenish yellow, light yellow to yellowish white; 3) Shevezova and Giemsa staining both show that the infected cells are filled with polygonal virus of 0.76 - 1.5 μ m diameter; and 4) no cross infection is observed when repeatedly applied to cotton bollworms and boll weevils.

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TITLE: "Fillers of Muscardine Insecticides"

SOURCE: Beijing WEISHENGWUXUE TONGBAO [Microbiology Bulletin] Vol 6
No 3, Jun 79 p 47

ABSTRACT: This newsbrief reports a comparative study on the use of calcium carbonate, white mud powder, pearl ash, yellow mud powder and furnace slag ash as fillers of muscardine insecticides. The results conclude that yellow mud powder, furnace slag ash and white mud powder are the more suitable fillers, because of their pH that approximate the pH 4.5-6.5 range that favors the germination of muscardine spores.

AUTHOR: None

ORG: This Journal

TITLE: "A Fodder Yeast Produced From Starch Production Waste and Sewage Laboratory Test and Confirmation Meeting"

SOURCE: Beijing WEISHENGWUXUE TONGBAO [Microbiology Bulletin] Vol 6
No 3, Jun 79 p 47

ABSTRACT: This newsbrief reports the convening of a meeting to confirm a process for the production of fodder yeast from two starch plant wastes and corn soaking water , sponsored by the Jilin Science and Technology Committee and the Jilin Commerce Bureau, on 15-18 April 1979 at Changchun and attended by 55 representatives from 40 related units. The process was jointly developed by the Jilin Institute of Light Industry Design and Planning, the Changchun Foodstuff Industrial Company, and the Changchun Starch Plant. The meeting decided the future direction and technological line of the project, and pointed out some existing problems with many suggestions.

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TITLE: "Application of Polyether Defoaming Agents in Kanamycin Fermentation"

SOURCE: Beijing WEISHENGWUXUE TONGBAO [Microbiology Bulletin] Vol 6
No 3, Jun 79 p 47

ABSTRACT: This newsbrief reports the successful use of polyoxyacrylic glycerin ether to replace part of the vegetable oil used as defoaming agent in kanamycin fermentation. If the amount of the chemical defoaming agent used is strictly controlled at 25%, the effect will be the same, while saving oil and foodstuffs. Other chemical defoaming agents tested give much poorer result.

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TITLE: "Joint Sino-Japanese Forum on Acetone Butanol Produced From Molass Fermentation"

SOURCE: Beijing WEISHENGWUXUE TONGBAO [Microbiology Bulletin] Vol 6
No 3, Jun 79 p 48

ABSTRACT: This newsbrief report the convening a Joint Sino-Japanese Forum on Acetone Butanol Produced From Molass Fermentation, sponsored by the Ministry of Light Industry. The forum discussed the technology of producing acetone butanol from molass fermentation, after the representative of the Xieho Fermentation Industry Plant of Japan introduced the production technology and the main technical parameters of the process.

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